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ABSTRACT

Each year thousands of students entering college participate in credit by examination programs in an effort to qualify for exemption and in many cases college credit for general education core requirements. The purpose of this study was to examine the differences between students who participate in a credit by examination program (in this case taking the College Level Examination Program, CLEP, general examinations in Natural Sciences, Social Science, and Humanities) and those of similar ability who do not. The hypothesis was advanced that an 'achievement tendency' exists which is a set of factors and/or motivators which result in better academic success in students of similar ability and that differences in interest and experience measures between the CLEP and Non-CLEP groups may predict this effect. While differences were found to be constant between the two groups across relevant variables (i.e. CLEP students were more self-assured, had greater expectations for achievement, and participate in more extracurricular activities), these differences on the whole were not statistically significant. Differences in academic performance as measured by GPA were not significant as well. (Author)

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CREDIT BY EXAMINATION: AN ANALYSIS OF EFFECTS AND MOTIVATIONS

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ABSTRACT

Each year thousands of students entering college participate in credit by examination programs in an effort to qualify for exemption and in many cases college credit for general education core requirements. The purpose of this study was to examine the differences between students who participate in a credit by examination program (in this case taking the CLEP general examinations in Natural Sciences, Social Science, and Humanities) and those of similar ability who do not. The hypothesis was advanced that an 'achievement tendency' exists which is a set of factors and/or motivators which result in better academic success in students of similar ability and that differences in interest and experience measures between the CLEP and Non-CLEP groups may predict this effect. While differences were found to be constant between the two groups across relevant variables (ie. CLEP students were more self-assured, had greater expectations for achievement and participate in more extracurricular activities), these differences on the whole were not statistically significant. Differences in academic performance as measured by GPA were not significant as well.

Background

Institutions of higher learning are faced with increasingly diverse groups of incoming students, both in terms of abilities and experiences. This diversity is due in part to the increasing number and range of high school seniors planning to enter higher education and an increase in the "non-traditional" students planning to enter college. This diversity has increased the need to match students with curricular level. Colleges have employed three procedures to match students with curricular level: placement, exemption, and credit by examination. While placement can be employed in any course sequence, exemption and credit by examination are usually employed to exempt students from or award credit for required courses.

A diverse student group contains students that have met only minimum requirements for entrance. Colleges have instituted general education requirements in broad liberal arts areas to insure basic knowledge for each student in these areas. Better students may have already gained this basic knowledge. Debate has arisen over whether incoming students demonstrating knowledge of general education requirements should be simply exempted from the requirements

or given college credit for knowledge of course material required of the less knowledgable students.

This research investigates the effects of a program of credit by examination. Specifically, an analysis of two groups of incoming freshman at a large midwestern university was undertaken. The first group participated in a credit by examination program. The second group elected not to participate in the program. The program offered up to 24 college credit hours for performance at high levels in the general subject areas of humanities, natural sciences, and social sciences. The testing program used three general examinations (Humanities, Natural Science, and Social Science) of the College Level Examination Program. The College Level Examination Program (CLEP), made available through the College Entrance Examination Board, is a credit by examination program which provides well prepared students with a means to satisfy basic graduation requirements by exhibiting competence beyond the level of introductory college courses. Tests are made available to member institutions and credit granting scores are set by the institutions.

A study of a credit by examination program as described above should be concerned with the differences between participants and non-participants. Such a program should attract the better students and encourage those who are successful to pursue more involved study in place of the entry requirements for which they have earned credit. The group

differences can be examined by contrasts of output measures (GPA's, credit hours obtained) and input measures (interests and experiences upon entry in the university). In this study, two areas of difference were investigated: first, the differences in academic success between CLEP takers and non-takers; and second, the differences in interests and experiences of the CLEP and Non-CLEP takers.

Research in this area has focused on the entering academic credentials of CLEP program participants as opposed to non-participants. In a summary of studies, Druesne(1982) indicated that students who elect to take CLEP have better academic credentials on the average upon admission to their institution than those who do not attempt or do not earn credit. The Druesne studies, as well as Enger and Whitney (1974) showed that those students who earned CLEP credit accumulated more semester hours and tended to graduate earlier and at a higher rate than those without CLEP credit. However, the Enger and Whitney study showed that higher graduation rate and earlier graduation could be predicted from differences in measures of academic ability and achievement upon admission to the university. Few studies investigating the differences between CLEP and Non-CLEP takers have controlled for academic ability. One study (Caldwell, 1977) looked at students who were advanced one year by achieving enough credit on CLEP and found that their grades in advanced courses were higher than those achieved by a control

group with similar admissions test scores and chronological ages. The present study attempted to examine differences between CLEP and Non-CLEP students in terms of academic performance and background interests controlling for academic ability.

Methods

Subjects. Subjects for the study were 1406 first-time freshmen at a large midwestern university drawn from 2801 incoming freshman of the class of fall 1979. Of the 1406, 407 participated in the June 1979 administration of the CLEP examinations and 999 did not. The sample excluded all students missing high school rank(HSR), ACT composite scores(ACTC), had fewer than 60 semester hours or were not enrolled in the second semester senior year(spring 1983). This was done because the study was primarily interested in comparing students who were attending the university for most of their undergraduate education. This eliminated 1395 or about 50% of the original 2801 incoming freshman.

Data Sources. Data were obtained from the following sources: CLEP examination scores, ACT test scores, the ACT Student Profile Report, and high school records. The CLEP examinations are multiple choice tests that measure academic skills in Humanities (Fine Arts and Literature), Natural Science (Biological and Physical Sciences), and Social Sciences-History (Social Sciences and History). The ACT Ass-

essment tests are multiple choice tests which measure academic skills in English, mathematics, natural science, and social science. A composite score based on performance in these areas is also provided. The Student Profile report provides information about the student's background; past accomplishments; special educational needs, interests, and goals; college extracurricular plans; financial needs; high school descriptive information and out-of-class accomplishments. Also provided in the Profile are standard scores from an ACT Interest Inventory. The standard scores for 6 interest categories (science, creative arts, social service, business contact, business detail, technical) are derived from 90 activities covering a broad range of interests.

Procedures. Two general analyses were performed. The first analysis described differences in academic performance between CLEP and Non-CLEP students. This was done by performing an analysis of residuals on the sample (N=1406). A regression analysis was carried out with predictor variables HSR and ACTC predicting college GPA. Residuals were calculated for the CLEP and Non-CLEP groups by subtracting the obtained predicted GPA scores from the actual GPA's and were subsequently compared using a *t* test. It was suspected that due to the regression effect there may be a bias for a group with higher predictor scores to have more positive residuals. In this case, the CLEP group would have had a positive mean residual independent of the proposed "achievement ten-

dency" which would then obscure the results of the t -test. To check for this possibitity the within group regression surfaces were compared as well. This was done by regressing GPA on HSR, ACTC, the dummy variable CLEP and the product variables CLEP*HSR and CLEP*ACTC. The surfaces were then compared by testing if the regression coefficients for the dummy and product variables equal zero. The hypothesis of equal slopes can be tested with the product variable regression coefficients. If the slopes are equal then the hypothesis of equal intercepts can be tested with the regression coefficient for the CLEP dummy variable.

The second analysis compared CLEP students with Non-CLEP students for differences in student Interest Inventory and Profile variables matching for academic achievement and ability. A new matched sub-sample was selected from the 1979 freshmen comprised of 157 CLEP and 157 Non-CLEP students. The two groups were stratified to match the CLEP student distribution in terms of academic ability and achievement. The variables used for sample selection were HSR and ACTC. A cross tabulation was performed on the 1406 CLEP and Non-CLEP students to obtain a profile of the CLEP and Non-CLEP distributions on the ACTC and HSR variables. HSR was divided into top, middle and bottom thirds and ACTC was divided into quantiles. The smaller percentage of Non-CLEP students in the top category of both HSR and ACTC limited the sample size to 157 students in each group. A random

sample was selected from the available pool of subjects in each ACTC by HSR category to form a stratified sample of matched CLEP and Non-CLEP students. A comparison of the frequency distributions showed that the samples were comparable on HSR, ACTC, age, and sex variables.

Using the original sample of 1406, 134 variables were factor analysized with varimax rotation into twenty orthogonal factors. A discriminant analysis was then performed on the 20 factors to see if the factors could discriminate between the CLEP and Non-Clep groups.

Results

The analysis of the four year college performance between the CLEP and Non-CLEP students did not support the hypothesis that the CLEP students would out-perform the Non-CLEP students. As expected the CLEP students (a much smaller sample (407) compared with the Non-CLEP (999)) scored better on the predictor variables ACTC and HSR (Table 1). The multiple R-square between the ACTC and HSR and college GPA after four years was 0.3685. Thus, 37% of the variance in college GPA is explained by the predictor variables. GPA residuals for the CLEP and Non-CLEP groups were not significantly different (Table 2).

Because the CLEP group generally clustered around the upper half of the GPA distribution, regression effects could have biased the residual means. This would result in spuri-

ously inflating the CLEP group residual mean. For example, notice from Table 2 that the CLEP mean GPA was 3.10 while the Non-CLEP mean was 2.77. The CLEP group is a smaller, more select group and has less variation around its mean than the Non-CLEP group. After regressing GPA on the predictor variables all predicted GPA's will have regressed somewhat toward the overall mean of the predicted GPA. Thus GPA scores higher than the mean will be slightly less and those lower than the mean will be slightly increased. This is simply due to the fact that the predictor variables only account for 37% of the total GPA variance. Recall that residuals are calculated by subtracting the predicted GPA score from the actual GPA score. Because a larger proportion of the CLEP sample than the Non-CLEP sample had scores above the mean GPA, a larger proportion of the predicted GPA's for the CLEP sample regressed downward toward the mean. This caused a larger proportion of CLEP residuals than the Non-CLEP residuals to be positive simply due to the fact that more CLEP takers than Non-CLEP takers clustered above the grand GPA mean. Table 2 shows that although the CLEP mean residual was slightly positive (0.02) while the mean Non-CLEP residual was slightly negative (-0.01) the difference was not significant. We have stated that a regression effect would probably cause some bias in the group mean residuals. Thus, it could be the case that the bias effect was actually masking a significant reverse relation-

ship, i.e., the CLEP group was not doing as well as the Non-CLEP students in terms of GPA.

To check for this possibility the within-group regression surfaces were compared. By comparing within-group regression surfaces the problem of comparing groups to the same mean as is done in the analysis of residuals is avoided. The test for coincidental surfaces was accomplished by forming two dummy variables. The model for each group is:

$$\text{est GPA} = bo + b1(HSR) + b2(ACTC)$$

where the b's are parameter estimates, HSR and ACTC are the predictor variables high school rank and ACT composite score described previously. Both regression surfaces can be compared directly by 1) creating a CLEP dummy variable where 1=participation in the CLEP program and 0=otherwise; and 2) forming two product variables CLEP*HSR and CLEP*ACTC. The new model becomes:

$$\text{est GPA} = bo + b1(HSR) + b2(ACTC) + b3(CLEP) + b4(CLEP*HSR) + b5(CLEP*ACTC)$$

When CLEP = 1:

$$\text{est GPA} = bo + b1(HSR) + b2(ACTC) + b3(1) + b4(1*HSR) + b5(1*ACTC)$$

Combining terms:

$$\text{est GPA} = (bo + b3) + (b1 + b4)(HSR) + (b2 + b5)(ACTC)$$

When CLEP = 0:

$$\text{est GPA} = bo + b1(HSR) + b2(ACTC)$$

Notice that the two equations are only equal if b3 = b4 = b5 = 0. Thus the two regression surfaces can be directly compared by testing the null hypothesis: Ho: b3=b4=b5=0. If the test for coincidence was significant, slopes could have been compared by Ho: b4=b5=0. If this proved non-significant, equality of intercepts could have been tested by Ho: b3=0 assuming equality of slopes. The test for coincidental surfaces (i.e., Ho: bCLEP=bCLEP*HSR=bCLEP*ACTC=0) was not significant: F(3,1400) = 0.9565. Consequently, no further tests were needed and the analysis of residuals result was confirmed.

The second analysis compared incoming characteristics and interests between the CLEP and Non-CLEP groups. Two random stratified samples (each with N=157) were drawn from the CLEP and Non-CLEP groups matching on HSR and ACTC. The two groups had almost identical means on ACTC (CLEP=26.51 vs. Non-CLEP=26.26), HSR (13.44 vs. 13.98), incoming age (18.36 vs. 18.39) and were almost equally composed of males and females (the CLEP group was evenly split 50-50 while the Non-CLEP group had 46% males and 54% females). It was anticipated that the statistical power to discriminate between

the two groups would be small due to the small sample size and the small magnitude of difference between the two groups. Thus, it was decided to compare differences between means and frequencies for each variable. The differences were consistently in the direction hypothesized but, as expected, were small in value.

Table 3 compares the percentages of the two groups' responses on several variables of interest. The CLEP group perceived themselves as being in the higher quarter of their high school graduating class (86% of the CLEP group thought they were in the top quarter compared with 83% of the Non-CLEP group). The CLEP group also saw themselves as getting a higher first year GPA than the Non-CLEP group did (32% of CLEP group thought they would get A- or higher compared with 26% of the Non-CLEP). Both these findings are significant in light of the fact that the CLEP individuals were matched with Non-CLEP individuals by high school rank and ACTC scores and thus had essentially the same HSR and high school GPA. The CLEP group felt that they needed less help in improving such skills as reading, math and studying (13%, 11% and 17% of CLEP felt they needed the above skills respectively as compared with 18%, 19%, and 21% of Non-CLEP). The CLEP group also expressed less interest in seeking help with personal concerns than their Non-CLEP counterparts (19% compared with 21%). Twice as many in the CLEP group had no siblings (19% of CLEP vs. 9% of Non-CLEP). And, not surpris-

ingly, the CLEP group showed greater interest in obtaining credit by examination than the Non-CLEP group (English, 61% of CLEP vs. 52% of Non-CLEP; math, 61% vs. 46%; social studies, 53% vs. 41%, and natural sciences, 46% vs. 41%).

A principle components factor analysis was used to identify underlying factors which could be responsible for the small but consistent group differences. The factor analysis was performed on the large sample (N=1406). A total of 134 background and interest variables were included in the analysis. To determine the number of factors to retain a scree plot was examined. A scree plot is a rule of thumb for determining the number of factors to be retained by examining a graph of eigenvalues and retaining only those factors which lie above the straight line with an almost horizontal slope in to which the remaining factors settle. Twenty orthogonal factors were retained accounting for 41.5% of the variance of total group of 134 factors. Factor coefficients were obtained and factor scores were then computed for the 314 sample cases. In order to assess if the two groups differed significantly in terms of background and interest variables a canonical discriminant analysis was performed on the factor scores using CLEP as the classification variable. Approximately normally distributed data within class was assumed. The Mahalanobis distance (which adjusts distances for differences in within-group variation) between the two group centroids was 0.57 standard deviations. How-

ever, the multiple squared correlation between the canonical variable (discriminant function) and the CLEP variable was not significant(R-square=0.076, F(20,204) =0.8271) indicating that the proportion of variation in the discriminant function explained by the two groups was not statistically significant given the small sample size.

Discussion

This study investigated differences between individuals who took the CLEP examination program at a large midwestern university in 1979 and those who did not but who had similar academic achievement levels. The hypothesis that those individuals who took CLEP possessed motivational and psychological characteristics that distinguised them from their Non-CLEP classmates was not confirmed statistically. The results indicate that CLEP students have a slight tendency to regard themselves more highly, to be more motivated, and participate in more activities than Non-CLEP students. These differences were consistent but too small to be statistically significant given the small sample size.

The hypothesis that the characteristics of CLEP students should lead to better performance in academics was not confirmed. A major reason for research in the academic persistence/performance area is to find variables which will predict success. Aptitude/Achievement test scores and high school performance have been shown in this study and others

to account for approximately 40% of the variance in college performance as measured by GPA. But this leaves unaccounted for 60% of the variance. This study indicated that although the CLEP group may have possessed greater self-assuredness and greater expectations, these qualities did not lead to greater academic success and thus CLEP as a variable does not account for any of the remaining 60% of the GPA variance. However, the results suggest that an "achievement tendency" trait may exist but that CLEP as a single indicator was insufficient to represent the trait. Further study should be conducted perhaps using multiple indicators of the latent variable "achievement tendency" within a structural equations model framework and a larger sample.

A factor that may have acted to dilute the results was the fact that twice as many students in the Non-CLEP sample (18.5%) were from another state than in the CLEP sample (9.9%). This could have resulted in CLEP type individuals being in the Non-CLEP group simply due to the inconvenience of driving long distances to the test administration center at the university. Such inconveniences, of course, would have been minimized for the in-state test participants.

In conclusion, the study showed that differences between CLEP and Non-CLEP takers can be accounted for almost completely by differences in academic ability and thus CLEP as a variable does not account for an appreciable amount of the variance of 4-year GPA when academic ability is controlled.

TABLE 1

Results of Regression Analysis

Variable	Mean	SD
CLEP (N=407)		
GPA	3.10	0.49
Predicted GPA	3.07	0.23
High School Relative Rank	13.30	12.95
ACT Composite Score	26.66	3.13
NON-CLEP (N=999)		
GPA	2.77	0.53
Predicted GPA	2.78	0.33
High School Relative Rank	25.53	18.65
ACT Composite Score	22.48	4.19

TABLE 2

Analysis of Residuals (GPA minus Predicted GPA)

Group	N	Mean	SD	T	
CLEP	407	0.02	0.43	-1.38	NS
Non-CLEP	999	-0.01	0.43		

TABLE 3

Response Percentages of Selected Variables

Variable	CLEP	Non-CLEP
My class rank in high school was top quarter	86.45	83.55
Estimate my GPA at the end of first year to be A- or higher	32.05	26.32
Very sure of current choice of program	34.61	30.07
Request help:		
in improving reading	13.46	18.30
in improving math skills	11.54	18.95
in improving study skills	16.67	20.91
with personal concerns	18.59	21.57
Was only child	18.59	9.15
Interested in obtaining credit by examination in:		
English	61.29	51.63
Mathematics	60.65	45.75
Social Studies	53.25	40.52
Natural Sciences	46.45	41.18

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